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وقوانين الجامعة الأردنية وأنظمتها وتعليماتها
لطلبة الماجستير

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اعلن بأنني قد التزمت بقوانين الجامعة الأردنية وأنظمتها وتعليماتها وقراراتها السارية المفعول المتعلقة باعداد رسائل الماجستير عندما قمت شخصيا" باعداد رسالتي وذلك بما ينسجم مع الأمانة العلمية وكافة المعايير الأخلاقية المتعارف عليها في كتابة الرسائل العلمية. كما أنني أعلن بأن رسالتي هذه غير منقولة أو مستلة من رسائل أو كتب أو أبحاث أو أي منشورات علمية تم نشرها أو تخزينها في أي وسيلة اعلامية، وتأسيسا" على ما تقدم فانني أتحمل المسؤولية بأنواعها كافة فيما لو تبين غير ذلك بما فيه حق مجلس العمداء في الجامعة الأردنية بالغاء قرار منحي الدرجة العلمية التي حصلت عليها وسحب شهادة التخرج مني بعد صدورها دون أن يكون لي أي حق في التظلم أو الاعتراض أو الطعن بأي صورة كانت في القرار الصادر عن مجلس العمداء بهذا الصدد.

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EQUITY NETWORKS AND PRICE SYNCHRONOICITY IN AMMAN STOCK EXCHANGE

By

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Supervisor

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This Thesis was submitted in Partial Fulfillment of the Requirements for the Master's Degree in Finance

Faculty of graduate studies

The University of Jordan

December, 2011

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EQUITY NETWORKS AND PRICE SYNCHRONOICITY IN AMMAN STOCK EXCHANGE

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Abstract

This study aims at investigating the effect of equity holdings between firms listed on Amman Stock Exchange on pair wise price synchronicity and whether changes in the level of price co movements can be explained by the existence and percentage of equity holdings between firms. In order to test this hypothesis, equity networks are constructed by using ownership structure of all firms at the end of 2008 year and by using weekly closing prices for 2009 year we construct two measures of price synchronicity (namely, correlation and frequency) and then by using Tobit and OLS regression models we can investigate the association between price synchronicity and equity holdings.

We find that Pairs of firms that share the same equity network are more likely to have returns that move in the same direction in any one week and have higher correlation coefficient with same direction change and frequency. Pairs of firms in the same industry or have financial firm are also more likely to have synchronous returns; large pairs tend to have more synchronous returns than smaller ones and direct ownership percentage is found to be positively associated with synchronicity even after controlling for size and same

industry effects. However, the cross holdings (reciprocal shareholdings) do not have significant effect on synchronicity as other variables.

Our results imply that the market participants (the investors) view equity networks as leading to more correlate fundamentals or as creating opacity of firm specific boundaries due to lack firm transparency and thus more correlated prices of the firms who join the same equity network or firm who have ownership percentage invested in other firm in the same pair.

Chapter one: General framework of the study

1.1 Introduction

Many theories have been presented to explain the behavior of stock prices like the CAPM but its limitation due to its dependence on market factor gave rise to other theories like APT which is a multivariable model to explain stock price movements. However, the level of explanatory power of these models depends on the country characteristics where in developed market there is less co movement between stock prices and lower R^2 than in emerging market (Morck etal ,2000) which reflects more firm specific information and more unsynchronized manner than in emerging markets because these differences in synchronicity can be attributed to many factors which pertain mainly to country differences such as ownership structure and the level of investor protection which affect the level of transparency and so on informed trading. The known image of modern corporations especially the large ones where they are widely held, and the control is separated from the owners is challenged because ownership structure in many developing countries is heavily concentrated (La Porta et al. 1998) and because of poor investor protection in many developing countries ,owners are reluctant to give up management to others because they are afraid of being expropriated hence they try to set the ownership structure in a way that enables them to control the firm. One of the remarkable ownership structures in Jordan is equity networks where ties among firms may emerge as firms take equity stakes in one another creating equity networks which can be a hallmark of business groups and ownership structure in many countries.

This study also relates the ownership structure to price behavior in a unique organizational and institutional framework and in context of corporate governance. While most studies have analyzed this relationship in light of complex of U.S corporate system which is characterized by dispersed ownership and active market for corporate control it is extremely useful to analyze this relation in different context for corporate working.

Our results demonstrate that the equity holdings between firms which create equity networks increase the pair wise synchronicity among firms that have total ownership percentage invested among them .We infer that shared firm ownership is considered to be relevant by the market participants when making their investment decision or is caused by less firms specific information due to poor transparency and that might have an implication on corporate governance due to the entrenchment effect by the largest controlling shareholders.

1.2 Problem of the study

Jordan is one of the emerging economies where stock prices have synchronous behavior (Bino et.al 2011). Jordan is one of the French civil law countries which has weak investor protection while, Common law countries have the strongest protection of outside investors Unlike legal rules, which do not appear to depend on the level of economic development, the quality of law enforcement is higher in richer countries. French legal Origin countries have weak law enforcement even after controlling for per capita income and it was shown that countries with poor investor protection typically exhibit more concentrated control of firms than countries with good investor protection (La Porta et al. 1998). Jordan recently has been involved in huge economic restructuring activity aimed at promoting local and foreign investment. This study provides policy implications as to how firms are owned and how this may affect price behavior through its effect on corporate governance, the level of transparency, and on the degree of informed trading because corruption drives rational investors away from developing markets leaving speculation which increases the co movement of stock prices (Morck etal.2000), especially during asset pricing bubbles hence making markets more susceptible to crashes. Markets perform a vital economic role by generating prices that serve as signals for resource allocation and investment decisions and an important condition for this is that stock prices should track its fundamentals.

This study focuses on an important aspect of ownership structure of Jordanian firms which is the equity networks, equity stakes between firms, which create unique business groups in Amman Stock Exchange (ASE). In this study we show the level of price co movements and ownership structure through mapping the equity networks in ASE. Having set those variables we test the impact of equity networks on pair wise co movements.

1.3 Importance of the study

The importance of the study stems from the fact that price synchronicity makes stocks more susceptible to crashes and thus more risky investment environment and as Jin and Myers (2006) find that there is a strong positive relation between R^2 and several measures of opaqueness(i.e., lack of transparency) (Jin& Myers, 2006). These measures also explain the frequency of crashes so this study will give a good picture to any investor on the amount of risk by showing the degree of price co movements of the listed firms.

If the equity networks and ties between firms relate to price movements and synchronicity there will be less firm specific information incorporated in the stock prices and more opaque information environment for the investors and so the higher synchronicity is associated with higher market variation in stock prices in emerging markets (Morck et al. 2000), higher market variation incorporates more market information due to hidden firms specific information. In this case the investors should collect more private information and set effective corporate governance not only for managers but also on the largest controlling shareholders because the implicit assumption of the hidden firm's specific information is the existence of managerial entrenchment (private benefits for the controlling owners) hence poor protection to outside investors (Fan and Wong, 2005 and Kim and Yi, 2006).

High stock price synchronicity has been associated with low gross domestic per capita (GDP), week investor protection and less information in stock prices changes. Based on previous research, we conjecture that price synchronicity can be explained by the way firms own and control each other by creating equity ties.

4.1 Objectives of the study

Unlike the cross-country focus in several prior studies, our analysis focuses on the firm-level analyses within a single country—Jordan. We investigate the extent to which equity networks are used in ASE and whether the equity networks can explain pair wise co movement and stock price changes and investigate whether corporate governance mechanism measured by the existence of equity networks can explain price behavior and synchronicity. In chapter two we present literature review of some related studies to our subject and in chapter three we construct theoretical framework of the study .In this chapter we construct hypotheses and we define our main independent and dependent variables, also we specify our regression model and statistical tools used in analyzing the data. In chapter four we form descriptive statistics for our variables and we use the regression formula to estimate the significant of our independent variables .In chapter 5 we provide conclusions and some recommendations.

Chapter two: Previous studies

2.1 Literature Review

The questions raised in this study pertain to two main lines of literature. First the stock price behavior and movement to whom many asset pricing models were presented such as CAPM and APT to explain price movements by risk factors like the market risk because stock price changes should be explained by general systematic influences, industry influences and events unique to the firm (Roll 1988). However the percentage of explained variation represented by R^2 is lower in developed market than in less developed or emerging markets because weak corporate governance in emerging market drives rational investors away from developing Markets , leaving the trading to uniformed speculators who depend on market information hence there will be correlated trading and high comovement, But perhaps the most direct evidence of the link between information and comovement is in Durnev et al(2003),who show that firms and industries with lower co movement have stronger associations between current earnings and future earnings. Due to weak governance and poor transparency, insiders in emerging countries release very little information to investors.

There is an increase in firm-level volatility relative to market volatility and so the correlation among individual stocks and the explanatory power of the market model for a typical stock in United States has declined, (Campbell et al. 2001).Therefore, Industry-level and idiosyncratic firm-level shocks are also important components of individual stock returns.

It is known that in developed markets, security analysts do not have an advantage over insiders or institutional investors in accessing firm-specific information. However, the payoff to analysts in emerging market who produce firm-specific information may be too low because it is not possible to arbitrage on it. Therefore, due to the difficulty associated with collecting firm-specific information in emerging markets ,the information that a security analyst collects might have more macroeconomic content than firm-specific details (Chan&Hameed 2006).Their interpretation is that, in emerging markets weak property rights discourage informed trading and therefore prevent firm specific information from being incorporated into stock prices.

Corporate ownership structure in emerging markets is well characterized by concentrated ownership by family members or government, divergence between cash-flow rights and voting rights, and firm affiliations with large business groups via cross shareholdings. This ownership structure is conducive to managerial entrenchment, and provides entrenched controlling owners with incentives and opportunities to extract private control benefits at the expenses of outside investors (Johnson et al 2000) and (Bertland et al 2002). In this environment, the controlling owners have incentives to withhold (or selectively disclose) value-relevant private information to outside investors to conceal the valuation implication of their self-serving behaviors (Fan and Wong 2005 and Kim and Yi, 2006). As a result, the cost of acquiring private information is likely to be higher, and the profit ability of informed trading is lower in emerging markets as compared to developed markets.

If firm-specific stock price movements reflect noise, then the presence of more security analysts decreases the level of noise, and consequently increases stock return synchronicity. According to Roll (1988), individual stocks in the U.S. exhibit low R^2 Statistics which suggests that much of the firm-specific information is incorporated into Stock prices. However, Roll also finds that firm-specific stock price movements are generally not associated with identifiable news releases, which suggests either that the financial press misses a great deal of relevant information that is generated privately or that price fluctuations are purely due to noise trading. Analyst activity is related to the corporate ownership structure because the demand for analyst services is likely to be greater in firms in which the ownership structure is widely dispersed. When there is an increase in the concentration of ownership, the acquisition of analyst services is not cost effective for small investors. As Ball et al. (1998) posit, when ownership is concentrated, information is likely to be communicated through private channels, thus decreasing the role of financial analysts. However, concentrated ownership by institutional investors such as pension funds and money managers may increase the demand for analyst services, because institutional investors who perform fiduciary roles use analyst reports as evidence of their due diligence (O' Brien and Bhushan, 1990).

This lack of firm specific information can be attributed to a number of factors. First, there is weak enforcement of the few regulations that related to information disclosure in the emerging markets. Second, there is a low degree of voluntary disclosure and corporate transparency. Third, many companies in emerging markets are group affiliated or family owned, and it is difficult to collect reliable information on such companies, but what causes less transparency can be partially related to the level of investor protection and the level of

corporate governance, hence a relation between price synchronicity and investor protection can surface. R^2 should be higher in countries where firms are more opaque (less transparent) to outside investors and crashes, that is large negative return outliers, should be more common for firms in opaque countries. R^2 is higher in countries with less developed financial systems, and there is evidence that R^2 has been declining over time internationally and there is a positive relation between country-average R^2s and several measures of opaqueness (Jin& Myers, 2006). Where they show that firms and industries with lower market model, R2 statistics, exhibit higher association between current returns and future earnings, indicating more information about future earnings in current stock returns. Higher firm-specific return variation as a fraction of total variation signals more information-laden stock prices and, therefore, more efficient stock markets. Stock markets perform a vital economic role by generating prices that serve as signals for resource allocation and investment decisions .This role has two parts: if stock prices are near their fundamental (full information) values, (1) capital is priced correctly in its different uses, and (2) this information provides corporate managers with meaningful feedback as stock prices change in response to their decisions. These two effects should lead to more economically efficient capital allocation, both between firms and within firms. Tobin [1982] defines the stock market as exhibiting functional efficiency if stock prices direct capital to its highest value uses; that is, the stock market is functionally efficient if it causes a micro economically efficient resource allocation. A necessary condition for functional stock market efficiency is that share prices track firm fundamentals closely.

Second line of literature pertains to ownership structure, where ownership concentration is higher in French-civil-law countries than in common-law-counties where investors are better protected, because measures of investor protection (for example, accounting standards, rule of law, and anti director rights index) are significantly negatively related to ownership concentration(LaPorta etal.1998).There are different ties between firms creating an association between different kinds of firm interlocks such as equity cross-holdings, common individual owners, and director interlocks where market wide synchronicity can be attributed at least in part to increased synchronicity between pairs of firms under joint control (Khanna& Thomas, 2009). Scholars in diverse disciplines – including anthropology, economics, history, political science, and sociology – have noted the ubiquity of business groups in emerging economies and have explored their behavior and performance. Group affiliation has a robustly large and often has beneficial effect on the financial performance of member firms (Chang and Choi, 1988; Khanna and Palepu, 2000 a, b and Khanna and Rivkin, 2001).

Markets in emerging economies are often thin, riddled with information gaps, and weakly supported by contract-enforcement institutions such as courts. These features expose trading partners to opportunistic behavior and raise the costs of transacting via the market (Williamson, 1975). In such a risky environment, ties are put in place among group affiliates to encourage the consummation of mutually beneficial exchanges that would be too costly to complete otherwise. Ties can reduce transaction costs by facilitating information flows between firms (Useem 1984; Granovetter 1985; Davis1991; Burt 1992; Podolny 1994 and Mizruchi 1996) or by aligning firms' interests, as when an equity cross-holding creates a situation of "mutual exchange of hostages" (Williamson 1983).

Information flow and interest alignment may work together: greater information flow may make the parties in a relationship aware of more opportunities for exchange, and greater alignment may make it more likely that exchange will be mutually beneficial. Moreover, a single type of tie may both facilitate information flow and align interests. A friendship between senior managers, for instance, may promote communication about opportunities and reduce the fear of opportunism (Ingram and Roberts, 2000).

A second interpretation of the origin and function of the ties among group members emphasizes the social nature of exchange rather than transaction costs. In uncertain environments – and emerging economies are notoriously marked by uncertainty – boundedly rational managers engage in repeated trade with the same partners rather than search for new partners (Geertz, 1978 and Podolny, 1994). Out of these on-going contacts emerge social relationships ranging from casual friendships to marriages. The social ties, in turn, reinforce the recurring patterns of exchange. Under extreme uncertainty, this process might imply highly redundant ties and "an exclusive, enclosed network" (Podolny, 1994: 482).

Inter-firm ties play a role in the process of social construction where field observers of groups have consistently identified groups with particular types of ties. Indeed economic models of groups have sometimes emphasized the role of equity to the near exclusion of all other types of ties (Wolfenzon, 1999 and Khanna, 2000). Businesses groups which are confederations of legally independent firms which can be created by equity ties are ubiquitous in emerging economies, yet very little is known about their effects. Business groups indeed affect the broad patterns of economic performance of the affiliated firms (Khanna&Rivkin, 2001).

Our study will contribute to literature by showing an important variable (equity networks) which affect the stock prices behavior and movements in one of the emerging markets, also studying ownership structure can carry implications on the corporate governance and minority shareholders rights. There are empirical papers on group effects, such as Bertrand, Mehta, and Mullainathan (2002) which in their study of Indian business groups, have focused on groups whose boundaries are defined by ownership ties and we can add to this literature the importance of ownership ties in forming equity network and business groups which affect the price synchronicity and co movements in Amman capital market.

In summary our study relate to price behavior literature which was presented by Roll in (1988) who explained the price movements based on risk and return characteristic of securities , then morck etal (2000) who tried to explain price behavior based on country characteristic and investor protection because they noticed high R square in emerging market compared to developed market , durnev et al (2003) linked the price movements to information because they noticed that firms and industries who have low co movements have strong association between current earnings and future earnings , Campbell (2001) emphasis the role of security analyst in collecting firm specific information in emerging market . our study relates also to ownership structure literature such as work done by la porta et al (1998) who studied ownership structure in emerging markets and specific ties that contribute to joint ownership and control such as equity networks applied to Chilean market Khanna and Thomas (2009) and the origin of ties (Geertz , 1987 and podolny,1994) ,(Wolfenzon , 1999 and Khanna,2000) and their effect (Khanna and Rivkin,2001) , (Mehta and Mullainathan ,2002) , (Williamson ,1983) and (Useem 1984;Granovetter 1985;Davis 1991; Burt 1992; Podolny 1994; Mizrchi 1996).

Chapter three: Theoretical framework of the study

3.1 Hypotheses

3.2 Methodology

3.2.1 Operational definitions

3.2.2 Data

3.3 Statistical analysis tools

3.3.1 Regression formula

3.3.2 Statistical tools

Based on the previous literature on price movements where there is high stock price synchronicity in Amman stock exchange as explored by (Bino etal 2011) and based on the previous literature on ownership structure and business groups and their effect on corporate governance and information environments and the prevalence of equity networks as main ties linking between firms listed in Amman Capital market we can form hypotheses and identify our variables.

3.1 Hypotheses

Based on previous theoretical and empirical findings, the following null hypotheses can be formulated.

1. H_{01}: The existence of an equity tie is not related to how prices of two firms move against each other (synchronicity).

2. H_{02}: the percentage of direct equity holdings between any two firms does not affect the way their prices move against each other (synchronicity).

3.2 Methodology

3.2.1 Operational definitions

This section presents of the operational definitions of the dependent and explanatory variables.

Dependent variables

1. Pairwise synchronicity:

Following Khanna and Thomas (2009), I use the following measures of synchronicity

$$f_{i,j} = \frac{\sum_{t=1}^{T}(n_{i,j}^{up} + n_{i,j}^{down})}{T_{i,j}} \quad (1)$$

Where

$n_{i,j}^{up}$ Equals one if the prices of both firms i and j move up in a given week and zero otherwise.

$n_{i,j}^{down}$ Equals one if the prices of both firms i and j move down in a given week and zero otherwise.

$T_{i,j}$ Is the number of weeks where both firms' stock prices move in either direction and we omit weeks where the price of either firm remains unchanged, to avoids any bias due to non trading, which could be of particular concern for the relatively illiquid Jordanian market. This adjustment is also used in Morck, Yeung, and Yu (2000, p. 222).

$f_{i,j}$: is the number of weeks that the stock prices of two firms in the pair move in the same direction during the year, divided by the total number of weeks in which both firms move in either direction during the year. If the prices of both firms always move in the same direction, $f_{i,j}$ =1 and if they always move in opposite directions, $f_{i,j}$ =zero.

The second measure of pair wise price synchronicity is the correlation coefficient between the returns of each pair of firms.

$$C(i,j) = \frac{\text{cov}(i,j)}{\sqrt{\text{var}_i * \text{var}_j}} \qquad (2)$$

For firms i and j where $C(i,j)$ is the covariance between the weekly returns of i and j for all weeks, var_i is the variance of firm i's weekly returns, and var_j is the variance of firm j's weekly returns.

Our measure of pair wise synchronicity $f_{i,j}$ is intended to capture time-period-specific shocks and is based on the number of weeks in which stock prices move in the same direction. The pair wise correlation coefficient $C(i,j)$ reflects both the direction and the magnitude of the movement in prices. We have one observation for each pair of firms taken for each dependant variable $f_{i,j}$, $C(i,j)$.

Independent variables

Direct and indirect equity holdings: many firms have equity ownership stakes between each other directly and/or indirectly(for example firm A has a stake in firm C not directly, but through an equity position in firm B, which in turn owns part of C , as shown in figure 1).

Following Khanna and Thomas (2009) I can provide an example of how the independent variables are determined

If firm A has a direct ownership in B equals to 10% and B has direct ownership in C equals to 20%, firm A has indirect ownership in C equal the product of ownership stakes along the chain which equals to 2% as represented by the shape in the left in figure (1).

If firm A has direct ownership in both firm C (10%) and firm B (20%) and firms B has direct ownership in firm D equals to 20%, and firm C has direct ownership in firm D equals to 15% then firm A owns the sum of the products of ownership along the two sides of the chain (1.5%+4.0% = 5.5%) as represented by the shape in the right in figure (1).

But we only consider ownership ties which are acquired either directly or indirectly through another one firm or by one layer as shown by the ownership of firm A in firm C in the left of figure (1) because firm A owns in firm B which owns in firm C. but we don't assume any ownership of firm A in firm D in the same figure because they are separated by more than one level or one firm, I will consider the existence of direct and indirect equity tie as a independent variables.

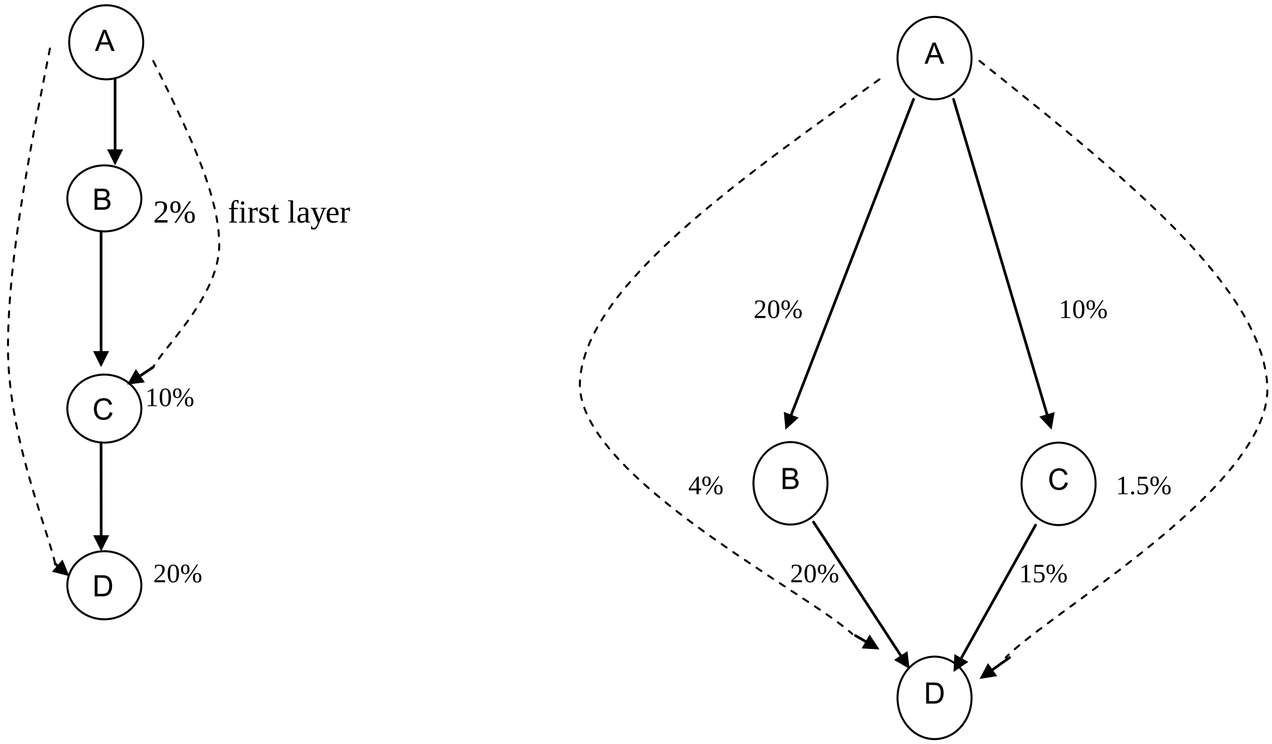


Figure (1): The Structures of Equity Networks

Control variables

Cross holding: following khanna and Thomas (2009) we use mutual investment between both firms in the same pair which is measured first as a dummy variable which takes one if there is cross holding between any pair of firms and zero otherwise, and second as the percentage of the total cross holding between the two firms.

Industry: Any two firms who belong to the same industry according to the classification of ASE**,** is measured as a dummy variable which is equal to one if the two firms are in the same industry and zero if they are in different industries**.** Because any two firms who are in the same industry may use the same inputs or operate in the same geographic market, therefore their prices might be correlated.

Size: Natural logarithm of the summation of book value of total assets for both firms in the pair. Returns on big firms lead returns on small firms within the same industry (kewei ,2007), a large body of evidence points to a lead-lag effect in stock prices, in which the returns of some firms react with a lag to innovations in returns of other firms. This cross-autocorrelation in stock returns is asymmetric for example; returns on small firms lag those of large firms, but not vice versa (Lo and MacKinlay (1990)).

Financial pair: measured as a dummy variable and equals one if any of the two firms in the same pair belong to financial industry and zero otherwise.

Pair wise Price synchronicity will be a function of (cross holding, equity ownership concentration, same industry, financial pair and firm size).

3.2.2 Data

ASE was established in 1978 and as of 2008 has 256 firms listed. For each firm, the ASE keeps record of weekly closing prices and identity of owners of 1% or more for all firms listed. we collect the ownership data at the end of 2008 whenever possible and I will have ownership structure for firms at the end of the year 2008 by forming an equity networks from the 256 listed at that time, so we can construct equity networks using one layer where each equity network contains only the direct equities using 1% ownership holding where any firm is defined as belonging to an equity network if it either owns some part of, or is owned in part by another firm in that network. If we have 256 we can have 31497 pair wise observations to calculate direct and indirect equity holdings between any two firms and pair wise co movements. It is worth noting that equity network membership, in our definition, is not related to the magnitude of interfirm equity holding. The weekly prices are taken from the weekly bulletins for the whole 2009 year for all listed firms. Where ASE keeps record of all closing prices traded during any week.

The largest amount of market capitalization is in the financial sector with an amount (12,467,851,270) with a (56%) of total market value at the end of 2009 year, the service sector market capitalization was (3,830,304,985) with (17%) of total market value and the industrial sector market capitalization was (5,995,454,150) with (27%) of total market value .

3.3 Statistical analysis tools

3.3.1 Regression model

To investigate the association between stock price synchronicity and the incidence of ownership between firms in the pair; I use the following specification

$$S_{ij} = \beta_0 + \beta_1 OWN_{ij} + \sum_{s=2}^{k} \beta_s X_{ij} + e_{ij} \qquad (5)$$

S_{ij} : is either $f_{i,j}$ which is the number of times that the stock prices of two firms in a pair move in the same direction, divided by the total number of weeks in which both firms move in either direction or $c_{i,j}$ which is the correlation coefficient between the returns of two firms in each pair.

OWN_{ij} : measured first as dummy variable which takes one if there is holding between any pair of firms and zero otherwise and second as the sum of percentage of holdings between two firms the pair.

X_{ij} : is a set of control variables and k is the number of control variables, the control variables include:

1. $Size_{ij}$: Natural logarithm of the summation of total assets for both firms in the pair.

2. Ind_{ij} : indicates whether both firms are in the same industry measured as dummy variable that is equal to 1 if both firms are in the same industry and zero otherwise.

3. fin_{ij} : is measured as dummy variable where it is equal to 1 if either or both firms are in the financial sector and zero otherwise.

4. CH_{ij} : measured as dummy variable if there is mutual investment between the two firms in the same pair

I have one observation for each pair of firms taken where the unit of analysis is pairs of firms.

3.3.2 **Statistical tools**

1. Descriptive statistic: The study use mean, median, standard deviation, min and max in comparing between different populations in my study.

2. T test: I use T test to see if there are any significant differences between the means of any two populations

3. Wilcoxon test: we use wilcoxon test to see if there are significant differences in the median between any two populations.

4. OLS estimation: we run a linear regression by using ordinary least squares which minimizes the sum of squares of errors resulting from linear regression between dependent and independent variables.

5. Tobit estimation: following Khanna and Thomas (2009), we run a Tobit regression because synchronicity which is measured by correlation is truncated between -1 and +1 and frequency, the other measure of synchronicity, is truncated between 0 and 1.

Chapter four: Data analysis and hypothesis testing

4.1 Descriptive statistics

4.2 Statistical analysis

4.1 Descriptive statistics

Because of illiquidity problem in Amman stock market where most listed shares are thinly traded on the secondary market (Omet , 2001) . We rely on firms who have more than 40 weeks of trading in explaining our results and make extra analysis in the appendix using 20 and 30 weeks of trading.

We form a descriptive analysis for all firms traded more than 40 weeks of trading during the year. Descriptive analysis using firms that have any trading week or more than 20 and 30 weeks of trading are in the appendix.

Table (1) presents mean, median, standard deviation, minimum and maximum for correlation, frequency, total ownership percentage, indirect ownership percentage and direct ownership percentage for firms who have more than 40 weeks of trading. We can notice that the mean and median are close to each other and thus near symmetric distribution for all variables. The minimum correlation is (-.93), the pairs who have this low correlation are Jordanian real estate for development company with the Industrial commercial agricultural company and Al niser alarabi insurance with middle east pharmiticual medical industries where the two pairs don't have any ownership percentage between the two firms in the pair. However the maximum correlations are in Arab real estate development with Rum Aladdin industries pair and Altajamouat for catering and housing company with specialized investment compounds pair where the two pairs does have an ownership percentage between both firms in the same pair. The lowest amount of frequency is zero like in Jordan Kuwait bank and Philadelphia Insurance pair where the two firms do not have any ownership percentages between them. However the highest amount

of frequency is 1, like in Tuhama for financial investments and Jordan Masaken for land industrial development projects where the two firms have a high ownership (.24).

The highest amount of total ownership percentage and direct ownership percentage invested between both firms in the same pair is between international insurance and Jordan international investment pair (.784) and at the same time they have high correlation and frequency (.81), (.7) respectively. The indirect ownership percentage is highest in the Investors and Eastern Arab for Industrial and real estate investment with Taameer Jordan holdings pair (.240), also they have high correlation and frequency (.71),(.69) respectively. The largest pairs in sizes are concentrated in the financial pairs where the highest one is between Arab bank and housing bank.

Table (1): summary statistics for firms who have more than 40 weeks of trading for all pairs

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Correlation	.103	.119	.454	-.93	.96
Frequency	.539	.540	.119	.00	1.00
Total ownership percentage	.002	.000	.019	.000	.784
Indirect ownership percentage	.0001	.000	.003	.000	.240
Direct ownership percentage	.0014	.000	.019	.000	.784
Size	34.56	34.20	2.39	26.81	46.26

Table (2) presents the mean, median, standard deviation, minimum and maximum for correlation, frequency, total ownership percentage, indirect ownership percentage, direct ownership percentage and size for firms who have more than 40 weeks of trading and have total ownership percentage between both firms in the same pair. We can notice the difference in the variables form the previous table because we only include the pairs who have ownership percentage, thus the mean and median for total ownership percentage, indirect ownership percentage and direct ownership percentage are higher than if we take all the pairs and at the same time we can notice that the correlation became much higher in this table, the mean for correlation increased from (.103) to (.238) and the median increased from (.119) to (.330) and also the mean and median for frequency have increased ,although not as much as the correlation. When we include pairs who have ownership percentage between both firms in the same pair, the mean and median of correlation and frequency increased and that indicates a relation between the synchronicity measured by correlation and frequency and total equity holdings measured by ownership percentages.

Table (2): summary statistics for firms who have more than 40 weeks only for pair whose ownership is more than zero

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Correlation	.238	.330	.486	-.860	.960
Frequency	.578	.583	.138	.000	1.00
Total ownership percentage	.074	.031	.113	.010	.784
Indirect ownership percentage	.006	.000	.016	.000	.240
Direct ownership percentage	.069	.027	.113	.000	.780
Size	36.11	36.16	2.77	30.27	45.32

4.2 Empirical Results

In table (3) We find the mean and the median for correlation, frequency and percentage of ownership with different specification, the first row shows the mean and median of those variables for pairs who have direct ownership, but the second row shows only the pairs who have indirect ownership, and the third row shows the pairs which have any ownership whether direct or indirect. However, the last row shows pairs who don't have any ownership.

We can relate the amount of ownership percentage whether direct or indirect to correlation and frequency by comparing the mean and median amounts of our dependent variable (correlation and frequency) to the existence and amount of ownership percentage, the pairs of firms who have direct ownership have higher mean correlation (.232), frequency (.573)

and ownership percentages (.083) than the means of correlation (.204), frequency (.566) and ownership percentages (.006) of pairs who have indirect ownership. Pairs of firms who have any ownership have higher mean correlation, frequency and ownership percentages (.238), (.578), (.074) respectively than the correlation, frequency and ownership percentages (.010), (.538), (.000) respectively than pairs who don't have ownership holdings which give a significant influence for our main independent variable (equity holdings between firms) to the synchronicity, because the higher the ownership percentage leads on average to higher amounts of synchronicity.

Table (3): The mean and the median for correlation, frequency and percentage of ownership

	Correlation		frequency		% of ownership	
	mean	median	mean	median	mean	median
Direct ownership	.232	.314	.573	.575	.083	.037
Indirect ownership	.204	.254	.566	.565	.006	.002
Total ownership	.238	.330	.578	.584	.074	.031
No ownership	.010	.115	.538	.539	.000	.000

To test if we have a statistical significant of total ownership percentage in synchronicity measured by correlation and frequency , we perform t-test to see if there are significant differences between the means of correlation and frequency for pairs who have total ownership percentage and for firms who don't have any ownership percentages, at the same time we can test if there are significant differences between the medians of correlation and

frequencies for pairs who have total ownership percentage and for firms who don't have any ownership percentages by using wilcoxon test, the two groups under analysis appear in the last two rows in table (3).

In table (4) We can notice the differences in synchronicity means measured by correlation and frequency between pairs who have ownership percentage and firms who don't have one; in order to know the significant of mean and median differences we apply T-test and wilcoxon test . T test results show the mean differences which are (.1382), (.0401) for the correlation and frequency respectively which are significant at (1%) level, so the average means of correlation and frequency for pairs of firms who have ownership percentages are significantly higher than pairs who don't ownership percentages and we have the same results for the median differences of the correlation and frequency (.2146), (.0448) respectively which are significant at (1 %) significant level using wilcoxon test.

Table (4): the mean and median differences for correlation and frequency

	with ownership			with no ownership			differences	
	Mean	Median	N	Mean	Median	N	Mean	median
Correlation	.2380	.3298	315	.0998	.1152	14736	0.1382*	0.2146*
Frequency	.5781	.5833	306	.5380	.5385	14531	.0401*	.0448*

*, ** significant at 1%, 5% level respectively

N: is the number of observations

According to our study we have encountered other variables that might have an effect on pair wise correlation and frequency which are size, industry, financial pairs, cross holdings and same equity network and we want examine their affect on synchronicity.

In table (5) we construct two groups of pairs; the first group includes pairs of firms who join the same equity network and the second group includes the pairs who do not, then we find the mean and median for direct ownership percentage, indirect ownership, percentage, correlation, frequency and total ownership percentage for the two groups.

We can notice the differences in synchronicity means and medians between all pairs who join the same equity network and pairs who do not; in order to know the significance of mean and median differences we apply T-test and wilcoxon test respectively .The mean and median of correlation (.186) (.214) respectively for pairs who join the same equity network are significantly higher than the mean and median (.094), (.110) respectively for pairs who do not. The mean and median differences of correlation and frequency between the two groups are significant at 1% significant level, therefore we should include it as control variable in our model.

Table (5): Pairs of firms classified according to same equity network membership

	Same equity network			Others			Differences	
	Mean	Median	N	Mean	Median	N	Mean	Median
Direct ownership percentage	.016	.000	1372	.000	.000	13679	.016*	.000*
Indirect ownership percentage	.002	.000	1372	.000	.000	13679	.002*	.000*
Correlation	.186	.214	1372	.094	.110	13679	.091*	.105*
Frequency	.554	.556	1332	.537	.539	13499	.017*	.017*
Total ownership percentage	.017	.000	1372	.000	.000	13679	.017*	000*

*, ** significant at 1%, 5% level respectively

N: is the number of observations

In table (6) we construct two groups of pairs; the first group includes pairs of firms who have cross ownership and the second group includes the pairs who don't ,then we can find the mean and median and their differences for direct ownership percentage, indirect ownership, percentage, correlation, frequency and total ownership percentage for the two groups.

Also we can test the differences in synchronicity means and medians between all pairs who have cross ownership and pairs who do not; in order to know the significance of mean and median differences we apply T-test and wilcoxon test respectively. The mean and median

of correlation (.482) (.487) respectively for pairs who have cross ownership are significantly higher than the mean and median (.102), (.118) respectively for pairs who do not. The mean and median differences of correlation and frequency between the two groups are significant 1% level, therefore we should we include it also as control variable in our model. At the same time we can notice a possible correlation between cross ownership existence and ownership percentage because there are significant differences in ownership percentages between the two groups, for example the mean total ownership percentages for pairs who have cross ownership is (.232) while the mean for pairs who do not have cross ownership is (.0012) and this because the firms who have mutual investment should have total ownership percentage , in fact it is special case of total equity holdings.

Table (6): pairs of firms classified according to cross ownership membership.

	Cross ownership			others			difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Direct ownership percentage	.230	.173	21	.001	.000	15030	.229*	.173*
Indirect ownership percentage	.003	.001	21	.000	.000	15030	.003*	.001*
Correlation	.482	.487	21	.102	.118	15030	.380*	.369*
Frequency	.622	.623	20	.539	.539	14817	.083**	.084*
Total ownership percentage	.232	.173	21	.001	000	15030	.231*	.173*

*, ** significant at 1%, 5% level respectively

N: is the number of observations.

In table (7) we construct two groups of pairs; the first group includes pairs of firms who have at least one financial firm in the pair, hence financial pair and the second group includes non financial pairs, and we find the mean and median and their differences for direct ownership percentage, indirect ownership, percentage, correlation, frequency and total ownership percentage between the two groups.

We notice the differences in synchronicity mean and median between all pairs who are financial (who have at least one financial firm in the pair) and for non financial pairs; to know the significance of mean and median differences we apply also the T-test and wilcoxon test respectively .The mean and median of correlation (.125) (.157) respectively for financial pairs are significantly higher than the mean and median (.066), (.062) respectively for non financial pairs. The mean and median differences of correlation and frequency between the two groups are significant at 1% level therefore we should include it as control variable in our model. The average total ownership percentage is significantly higher in the financial pairs compared to non financial pairs.

Table (7): Pairs of firms classified according to financial pair indicator

	financial firm			non financial firm			difference	
	Mean	Median	N	Mean	Median	N	Mean	Median
Direct ownership percentage	.002	.000	9338	.001	.000	5713	.001*	.000*
Indirect ownership percentage	.0002	.000	9338	.0001	.000	5713	.0001*	.000*
Correlation	.125	.157	9388	.066	.062	5713	.059*	.096*
Frequency	.542	.544	9177	.534	.533	5660	.008*	.010*
Total ownership percentage	.002	.000	9338	.001	.000	5713	.0013*	.000*

*, ** significant at 1%, 5% level respectively

N: is the number of observations

In table (8) we construct two groups of pairs by taking the size median for all pairs then we classify any pair which is above the median as a large size pair and observations below the median as a small size pair; the first group includes large pairs and the second group includes small pairs, and we find the mean and median and their differences for direct ownership percentage, indirect ownership percentage, correlation, frequency and total ownership percentage between the two groups.

If we classify pairs according to their size ,the first group of pairs are large one and the second group contains pairs who are small and we can notice the differences in synchronicity means and medians between the two groups and in order to statistically test

the significance of mean and median differences we apply the T-test and wilcoxon test respectively .The mean and median of correlation (.127) (.150) respectively for large pairs are significantly higher than the mean and median (.071), (.079) respectively for small pairs. The mean and median differences of correlation and frequency between the two groups are significant at 1% level therefore we should include it as control variable in our model. The average total ownership percentage is significantly higher in the large pairs compared to small pairs.

Table (8): Pairs of firms classified according to size

	Pairs of large firms			pairs of small firms			differences	
	Mean	Median	N	Mean	Median	N	Mean	Median
Direct ownership percentage	.002	.000	8626	.009	.000	6425	.001*	.000*
Indirect ownership percentage	.0002	.000	8626	.000	.000	6425	.0002*	.000*
Correlation	.127	.150	8626	.071	.079	6425	.056*	.071*
Frequency	.544	.544	8465	.533	.533	6372	.011*	.010*
Total ownership percentage	.002	.000	8626	.001	.000	6425	.001*	.000*

*, ** significant at 1%, 5% level respectively

N: is the number of observations

In table (9) we construct two groups of pairs, the first group is the pairs of firms who are in the same industry and the second group is pairs of firms who are not on the same industry according to three main classification for industry type (financial, services, industry) .We find the mean and median and their differences for direct ownership percentage, indirect ownership percentage, correlation, frequency and total ownership percentage between the two groups.

Also we classify pairs according to same industry membership or not, so we notice the differences in synchronicity mean and median between all pairs who join the same industry and pairs who do not; in order to know the significance of mean and median differences we apply T-test and wilcoxon test respectively. The mean and median of correlation (.135) (.175) respectively for pairs who join the same industry are significantly higher than the mean and median (.084), (.087) respectively for pairs who do not. The mean and median differences of correlation and frequency between the two groups are significant at 1% significant level therefore we should include it as control variable in our model.

Table (9): Pairs of firms classified according to same industry membership

	Same industry			not on same industry			differences	
	Mean	Median	N	Mean	Median	N	Mean	Median
Direct ownership percentage	.002	.000	5548	.001	.000	9503	.001*	.000*
Indirect ownership percentage	.0002	.000	5548	.0001	.000	9503	.0001*	.000*
Correlation	.135	.175	5548	.084	.087	9503	.050*	.088*
Frequency	.542	.543	5441	.537	.539	9396	.005*	.004*
Total ownership percentage	.003	.000	5548	.0001	.000	9503	.002*	.000*

*, ** significant at 1%, 5% level respectively

N: is the number of observations

In summary we notice that all control variables influence synchronicity because if we classify pairs according to existence of the control variables we can find a significant differences in mean and median for correlation and frequency. However we notice at the same time the changes in mean and median for the main independent variable, the ownership percentage, thus a possible correlation between our main independent variableand control variables might surface; to test we can use pearson and spearman correlation. The Pearson correlation as shown in table (10) between same equity network and total ownership percentage is (.252) which is significant at the 5% level and this is because some of the firms in the same equity network have ownership percentage invested

between them, also the correlation is higher between cross holdings and total ownership (.442) which is significant at the 5% level. Although the correlation between the rest of control variables (same industry, size, financial dummy) and total ownership percentage (.038), (.051), (.030) respectively is low, it is significant at the 5% level. The Pearson correlation between the same equity network and the rest control variables is significant at the 5% level. However, the correlation between cross holding and financial dummy is significant at 1% level but correlation between cross holding and size is not significant at all.

In table (11) the spearman's correlation between same equity network and total ownership percentage is (.462) which is significant at the 5 %, and the correlation between cross holding and total ownership percentage is (.260) which is significant at the 5 %. Although the correlation between the rest of control variables (same industry, size, financial dummy) and total ownership percentage (.036), (.083), (.064) respectively is low, it is significant at the 5% level. However the spearman's correlations between cross holding and financial dummy is significant at 1% level but correlation between cross holding and size is not significant at all. In fact we have the exact significance levels in the Pearson and spearman and nearly the same amount of correlation coefficient between control variables and total ownership percentages and between the control variables in both tests.

In summary ,we can notice that the spearman's and Pearson correlations are mostly significant between the control variables and also between them and the total ownership percentage , in table (3) we notice that the mean and median of synchronicity change if we include pairs who have ownership percentage and pairs who do not ,also we test the affect of each control variable on synchronicity However the last analysis reveals that there are correlations between the control variables (size, same industry, financial, cross holding, same equity holding) and our main independent variable which is ownership percentage. In order to run regression properly and to have accurate beta estimates for our independent variables we should include those control variables because they have an effect on synchronicity and at the same time have correlations with ownership percentages.

Table (10): Pearson correlations between independent variables

	Same equity network	Cross holding	Same industry	Size	Financial dummy
Same equity network	1.00				
Cross holding	.118**	1.00			
Same industry	.051**	.027**	1.00		
Size	.080**	.012	.052**	1.00	
Financial dummy	.047**	.018*	.060**	.179**	1.00
Total ownership percentage	.252**	.442**	.038**	.051**	.030**

**. Correlation is significant at the 1% level (2-tailed).

*. Correlation is significant at the 5% level (2-tailed).

Table (11): Spearman's Correlations between the independent variables

	Same equity network	Cross holding	Same industry	size	Financial dummy
Same equity network	1.00				
Cross holding	.118**	1.00			
Same industry	.051**	.027**	1.00		
Size	.057**	.012	.039**	1.00	
Financial dummy	.047**	.018*	.060**	.150**	1.00
Total ownership percentage	.462**	.260**	.036**	.083**	.064**

**. Correlation is significant at the 1% level (2-tailed).

*. Correlation is significant at the 5% level (2-tailed).

After determining the independent variables and control variables, we do the regression using the Tobit estimation at many specification and models using the two measures of synchronicity (Dependent variables).

The independent variables in each model

A. Model 1 (direct ownership percentage)

B. Model 2 (direct ownership percentage , size)

C. Model 3 (direct ownership percentage , size, financial indicator)

D. Model 4 (direct ownership percentage , size, financial indicator, cross holding)

E. Model 5 (direct ownership percentage , size, financial indicator, cross holding, same industry)

F. Model 6 (direct ownership percentage , size, financial indicator, cross holding, same industry, same equity network)

G. Model 7 (Direct ownership indicator, size, financial indicator, cross holding, same industry, same equity network)

H. Model 8 (Direct ownership >0 ,Size, Financial indicator, Cross holding, Same industry)

When we run the tobit regression between correlation as our first measure of synchronicity with the specification models as shown in table (12) we find that the direct ownership coefficient is positive and significant at 1% level but when we add size as in model 2 the coefficient amount decrease to 1.56 but still significant at the same level and size have a positive significant coefficient (.018) and if we add financial dummy indicator as in model 3 it will be significant at 1% level but the amount of direct ownership and size will decrease but remain significant . However when we add cross holdings as in model 4 it will not be significant even at 5% level. In model 5 we can notice that same industry has a positive significant coefficient at 1% level and at the same time the coefficient of other variables will remain significant at the same level. however when we add same equity network indicator to our model as in model 6 the significant of direct ownership percentage falls from 1% significance to 5% level , also the amount of coefficient decreased from (1.16) to (.75) . In model 7 we replace direct ownership percentage with direct ownership indicator which is dummy variable that indicates if there is direct ownership or not and we keep all control variables, in this model the direct ownership indicator is not significant and all

control variables are significant at 1% level even the cross holding variable which was not significant in the previous models is now significant. In model 8 we replace direct ownership indicator with direct ownership percentage for pairs who have a direct ownership percentage greater than zero and we have different results concerning the significant of coefficient for all control variables where they all became not significant. As a result the amount change of the direct ownership between firms doesn't significantly explain the correlation coefficient changes. In summary Model 6 is significant at the 1% significance level indicating high explanatory power of direct ownership percentages in explaining the pair wise correlation even after controlling for other significant variables such as size, financial Indicator, same industry and same equity network. However the direct ownership variable significance falls from 1% to 5% when we include same equity network indicator variable in the regression. The cross holding is not significant even at the 5% level which indicate that the investor are not concerned whether the firm has cross holding with the other firm, they are concerned whether the firm has an ownership percentage invested as equity holding in that other firm. If we use direct ownership percentage as main independent variable we cannot have significant results in our model.

In model 7 we perform another test by using different independent variable with the same controlling variable which is direct ownership indicator measured as a dummy variable which indicates whether there is a direct ownership between the two firms in the pair or not. The results of this test reveal that if we take the direct ownership as dummy and relate it to synchronicity as measured by correlation we can't find significant estimates for the independent variable but the control variables remains significant. Because we have included the same equity network variable we cannot have significant results for direct

dummy variable which indicates that the same equity network explains correlation better than direct dummy variable.

When we take the observations that contain non zero direct ownership percentage as our data sample and run regression using direct ownership percentage variable with the other control variables and test the regression as shown in model 8 ,we can't find significant relations with direct ownership and even the control variables are not significant (size, financial indicator, same industry , cross holdings) which indicates that the level of direct ownership is less important than the direct ownership existence, therefore the variation of correlation can't be significantly explained by the level of direct ownership between the pairs of firms.

Table (12): variables coefficients using Tobit estimation with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.143*	-.476	-.432*	-.434*	-.437*	-.423*	-.433*	-.572
Direct ownership percentage	1.704*	1.56*	1.52*	1.11*	1.16*	.750**		
Size		.018*	.015*	.015*	.015*	.014*	.015*	.029
Financial indicator			.069*	.069*	.066*	.064*	.064*	-.309
Cross holding				0.351	.340	.338	.478*	.445
Same industry					.062*	.060*	.060*	.180
Same equity network						.097*	.102*	
Direct ownership indicator							.022	
Direct ownership >0								.916
Pseudo R^2	.002	.005	.008	.008	.010	.011	.011	.060

*, **Significant at 1%, 5% level respectively

When we run the tobit regression between frequency as our second measure of synchronicity in the specification models as shown in table (13) we find that the direct ownership coefficient is positive and significant at 1% level for all models even if we control for the same equity network variable as in model 6, but when we start adding the control variables from model (2) to model (6) amount of coefficient starts to decrease from (.240) to (.187) but remain significant at 1% level. The size variable has a positive significant coefficient (.002) and if we add financial dummy indicator as in model 3 it will be significant also at 1% level. However when we add cross holdings variable as in model 4 it will not be significant even at 5% level. In model 5 when we add same industry it will have positive small significant coefficient but its significance level is at 5% level but when we add same equity network as in model 6 we can notice that same industry became insignificance while the other variables keep their significance levels. In model 7 the direct ownership indicator is significant at 5% level and all control variables are significant at 1% level except for the cross holding variable and same industry. In model 8 we have different results concerning the significant of coefficient for most of the control variables where they all became not significant but the direct ownership for pairs who have direct ownership percentage more than zero is significant at 5% level. As a result the amount change of the direct ownership between firms does explain the frequency changes. In summary Model 1 is significant at the 1% significance level indicating high explanatory power of direct ownership percentage in explaining the frequency even after controlling for other significant variables such as size, financial Indicator, same industry and same equity network.

The changes in frequency are significantly explained by the amount of direct ownership and the existence of direct ownership between the pairs of firms in contrast with the result when we use the correlation as dependent variable.

Table (13): variables coefficients using Tobit estimation with frequency as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.537*	.454*	.458*	.458*	.458*	.449*	.450*	.695*
Direct ownership percentage	.255*	.240*	.237*	.230*	.227*	.187*		
Size		.002*	.002*	.002*	.002*	.002*	.002*	-.003
Financial indicator			.006*	.006*	.006*	.005*	.005*	-.006
Cross holding				.010	.009	.011	.038	.000
Same industry					.004**	.002	.002	.005
Same equity network						.012*	.011*	
Direct ownership indicator							.016**	
Direct ownership >0								.128**
Pseudo R^2	-.001	-.003	-.004	-.004	-.004	-.004	-.004	-.020

*, ** significant at 1%, 5% level respectively

We can perform estimation by using OLS analysis for the firms who have more than 40 weeks of trading. In this case the results will resemble the Tobit estimation.

When we run the OLS regression between correlation with other control variables in the specification models As shown in table (14) we find that the direct ownership coefficient is positive and significant at (1%) level but when we add size as in model 2 the coefficient amount decrease to .897 but still significant at the same level . size has a positive significant coefficient (.013) and if we add financial dummy indicator as in model 3 its coefficient will be positive and significant at 1% level but the amount of direct ownership and size will decrease but remain significant . However when we add cross holdings as in model 4 it will not be significant even at 5% level. In model 5 we can notice that same industry has a positive significant coefficient at 1% level and at the same time the coefficient of other variables will remain significant at the same level. However when we add same equity network indicator to our model as in model 6 the significant of direct ownership percentage falls from 1% significance to 5% level , also the amount of coefficient decreased from (.666) to (.433) . In model 7 the direct ownership indicator is not significant and all control variables are significant at 1% level even the cross holding variable which was not significant in the previous models is now significant at 1%. In model 8 the significance of coefficients for all control variables are not significant except for the financial indicator where it is significant at 5% level. The results are exactly the same concerning the significant of the variables except the financial indicator in model 8 , also the magnitude of the coefficients of all variables are higher using tobit estimation compared to OLS estimation.

Table (14): coefficients estimates using OLS with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.101*	-.332*	-.301*	-.302*	-.304*	-.291*	-.293*	-.302
Direct ownership percentage	.972*	.897*	.873*	.695*	.666*	.433**		
Size		.013*	.011*	.011*	.010*	.010*	.010*	.016
Financial indicator			.049*	.049*	.047*	.045*	.045*	-.159**
Cross holding				.201	.194	.186	.269*	.200
Same industry					.044*	.042*	.042*	.094
Same equity network						.068*	.071*	
Direct ownership indicator							.014	
Direct ownership >0								.416
Pseudo R^2	.002	.006	.009	.009	.011	.013	.012	.063

*, ** significant at 1%, 5% level respectively

When we run the OLS regression using frequency as dependant variable in the different specification models as shown in table (15) we find that the direct ownership coefficient is positive and significant at 1% level for all models even if we control for the same equity

network variable as in model 6 but when we start adding the control variables from model 2 to model 6 the amount of coefficient starts to decrease from (.254) to (.184) but remain significant at 1% level. The size variable has a positive significant coefficient (.002) and if we add financial dummy indicator as in model 3 it will be significant also at 1% level. However when we add cross holdings variable as in model 4 it will not be significant even at 5% level. In model 5 when we add same industry it will have positive significant coefficient but at 5% level. In model 7 the direct ownership indicator is not significant while cross holding became significant at 5% level. In model 8 we have different results concerning the significant of coefficient for most of the control variables where they all became not significant but the direct ownership for pairs who have direct ownership percentage more than zero is significant at 5% level.

OLS estimation using the frequency as dependent variable provides different results from tobit estimation. Firstly ,cross holding is significant in model 7 using the OLS against the Tobit estimation at the 5% level, secondly same industry is significant using the OLS at the 5% for all models except for the last one, finally the direct ownership indicator is not significant using the OLS against the Tobit estimation in model 7.

Table (15): coefficients estimates using OLS with frequency as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.538*	.464*	.468*	.467*	.467*	.469*	.470*	.612*
Direct ownership percentage	.267*	.254*	.251*	.226*	.224*	.184*		
Size		.002*	.002*	.002*	.002*	.002*	.002*	-.001
Financial indicator			.006*	.006*	.006*	.006*	.005*	-.018
Cross holding				.029	.029	.027	.053**	.025
Same industry					.004**	.004**	.004**	.001
Same equity network						.012*	.011*	
Direct ownership indicator							.016	
Direct ownership >0								.169**
Pseudo R^2	.002	.004	.004	.004	.005	.005	.005	.032

*, ** significant at 1%, 5% level respectively

Comparing our results with Khanna and Thomas,(2009) where their study focused on equity networks in Chilean market where they found a positive effect of equity networks on correlation coefficients but there was no significance if they use frequency as a dependant variable and their significances levels were based on 10% level. The total equity holding, same industry and same equity network were significance using correlation but were not significance using frequency. However our results are stronger concerning the significance levels where we have significant coefficients for equity holdings and same equity networks using both measures of synchronicity (correlation and frequency).

Chapter 5: Conclusions and recommendations

Pairs of firms that share the same equity network are significantly more likely to have returns that move in the same direction in any one week and to have a higher correlation coefficient and frequency. Pairs of firms in the same industry or have financial firm are also more likely to have synchronous returns; large pairs tend to have more synchronous returns than smaller one and direct ownership percentage are shown to be positively associated with synchronicity even when controlling for size and same industry effects. However, the cross holding don't have the same affect on synchronicity as other variables.

We can interpret the results as evidence that the market views equity networks as leading to more Correlated fundamental or as creating opacity of firm- specific boundaries.

We might speculate that co movement associated with equity ties reflects coordination in the form of earnings tunneling for the benefit of an entrenched controlling shareholder (Morck, Wolfenzon, and Yeung, 2005) or is simply due to anticipated dividend flows.

We have to look closely on the corporate governance practices in Jordanian firms because equity networks can provide the firms a mechanism to control other firms by using less cash flow investment and the price co movements resulting from equity networks might be an indication for less firm transparency due to entrenchment effect for the largest controlling shareholder. Based on this study we recommend investigating the affect of managerial ownership and ownership structure on the value of firms because the

concentrated ownership structure might provide more control rights than cash flow rights by using pyramidal ownership mechanism and superior voting rights and that will provide incentives for the largest controlling shareholder to extract private benefits instead of enhancing the value of the firm, thus the corporate governance might be affected negatively by ownership structure.

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Appendices

This table presents the mean, median, standard deviation, minimum and maximum for correlation, frequency, total ownership percentage, indirect ownership percentage, direct ownership percentage and size for all firms listed whether traded or not.

Table (1) summary statistics for major variables for all firms traded during the year

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Correlation	.076	.076	.477	-1.00	1.00
Frequency	.529	.531	.167	.000	1.00
Total ownership percentage	.001	.000	.016	.000	.784
Indirect ownership percentage	.0001	.000	.002	.00	.24
Direct ownership percentage	.0010	.000	.016	.00	.78
Size	34.073	33.818	2.30	25.91	46.26

table (2) and (3) present the mean, median, standard deviation, minimum and maximum for correlation, frequency, total ownership percentage, indirect ownership percentage, direct ownership percentage and size for all firms who have more than 20 weeks or 30 weeks of trading.

Table (2): summary statistics for major variables for firms who have more than 20 weeks of trading during year

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Correlation	.0893	.1031	.4458	-.94	.97
Frequency	.5314	.5333	.127	.00	1.00
Total ownership percentage	.00130	.0000	.0174	.0000	.78438
Indirect ownership percentage	.0001	.0000	.00230	.00	.24
Direct ownership percentage	.0012	.0000	.01703	.00	.78
Size	34.235	33.91	2.317	25.91	46.26

Table (3): summary statistics for major variables for firms who have more than 30 weeks of trading during the year

Variable	Mean	Median	Std. Deviation	Minimum	Maximum
Correlation	.1000	.1122	.4449	-.93	.96
Frequency	.5348	.5357	.1223	.00	1.00
Total ownership percentage	.0013	.0000	.0179	.000	.784
Indirect ownership percentage	.0001	.0000	.00232	.00	.24
Direct ownership percentage	.0013	.0000	.01747	.00	.78
Size	34.37	34.04	2.365	25.91	46.26

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using tobit estimation with correlation as dependent variables for firms who have more than 20 weeks of trading.

Table (4): Tobit estimation for firms who have more than 20 weeks with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.119*	-.504*	-.480*	-.480*	-.490*	-.470*	-.470*	-.210
Direct ownership percentage	1.24*	1.09*	1.06*	.800*	.770*	.510		
Size		.018*	.016*	.016*	.016*	.015*	.015*	.010
Financial indicator			.053*	.054*	.051*	.050*	.050*	-.110
Cross holding				.337**	.329**	.317**	.380*	.340**
Same industry					.040*	.039*	.039*	.090
Same equity network						.065*	.060*	
Direct ownership indicator							.030	
Direct ownership >0								.544
Pseudo R^2	.000	.005	.007	.007	.008	.009	.008	.032

*, ** significant at 1%, 5% level respectively

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using tobit estimation with frequency as dependent variables for firms who have more than 20 weeks of trading.

Table (5): Tobit estimation for firms who have more than 20 weeks with frequency as dependent variable

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
constant	.530*	.415*	.418*	.418*	.417*	.420*	.420*	.612*
Direct ownership percentage	.238*	.213*	.210*	.194*	.192*	.145*		
Size		.003*	.003*	.003*	.003*	.003*	.003*	-.001
Financial indicator			.006*	.006*	.006*	.006*	.006*	.016
Cross holding				.023	.022	.019	.032	.013
Same industry					.003**	.003**	.003**	.001
Same equity network						.013*	.012*	
Direct ownership indicator							.015**	
Direct ownership >0								.128**
Pseudo R^2	.000	-.004	-.005	-.005	-.005	-.005	-.005	-.016

*, ** significant at 1%, 5% level respectively

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using OLS estimation with correlation as dependent variables for firms who have more than 20 weeks of trading.

Table (6): OLS estimation for firms who have more than 20 weeks with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.088*	-.369*	-.354*	-.355*	-.359*	-.347*	-.348*	-.124
Direct ownership percentage	.800*	.704*	.685*	.525*	.506*	.335		
Size		.013*	.012*	.012*	.012*	.012*	.012*	.009
Financial indicator			.040*	.040*	.038*	.038*	.038*	-.075
Cross holding				.213**	.207**	.197**	.239*	.194**
Same industry					.030*	.029*	.029*	.059
Same equity network						.048*	.048*	
Direct ownership indicator							.024	
Direct ownership >0								.313
Pseudo R^2	.001	.006	.008	.008	.009	.010	.010	.034

*, ** significant at 1%, 5% level respectively

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using OLS estimation with frequency as dependent variables for firms who have more than 20 weeks of trading.

Table (7): OLS estimation for firms who have more than 20 weeks with frequency as dependent variable

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
constant	.531*	.422*	.424*	.424*	.423*	.426*	.426*	.555*
Direct ownership percentage	.249*	.225*	.223*	.194*	.192*	.147*		
Size		.003*	.003*	.003*	.003*	.003*	.003*	.000
Financial indicator			.006*	.006*	.006*	.006*	.006*	.007
Cross holding				.039	.038	.036	.056**	.034
Same industry					.004**	.003**	.004**	-.001
Same equity network						.013*	.013*	
Direct ownership indicator							.008	
Direct ownership >0								.163**
Pseudo R^2	.001	.004	.005	.005	.005	.006	.006	.027

*, ** significant at 1%, 5% level respectively

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using tobit estimation with correlation as dependent variables for firms who have more than 30 weeks of trading.

Table (8): Tobit estimation for firms who have more than 30 weeks with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.130*	-.470*	-.440*	-.440*	-.440*	-.430*	-.437*	-.371
Direct ownership percentage	1.50*	1.36*	1.32*	1.05*	1.02*	.750**		
Size		.017*	.015*	.015*	.015*	.014*	.014*	.019
Financial indicator			.060*	.060*	.058*	.057*	.057*	-.186
Cross holding				.306**	.298	.290	.412*	.347
Same industry					.043*	.042*	.042*	.089
Same equity network						.065*	.070*	
Direct ownership indicator							.021	
Direct ownership >0								.966**
Pseudo R^2	.001	.005	.007	.008	.009	.009	.009	.048

*, ** significant at 1%, 5% level respectively

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using tobit estimation with frequency as dependent variables for firms who have more than 30 weeks of trading.

Table (9): Tobit estimation for firms who have more than 30 weeks with frequency as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.533*	.420*	.420*	.420*	.420*	.420*	.429*	.624*
Direct ownership percentage	.254*	.230*	.220*	.217*	.210*	.170*		
Size		.003*	.003*	.003*	.003*	.003*	.002*	-.001
Financial indicator			.003**	.003**	.003**	.003**	.003**	.000
Cross holding				.015	.014	.012	.028	.005
Same industry					.002*	.001	.001	.008
Same equity network						.012*	.011*	
Direct ownership indicator							.018*	
Direct ownership >0								.143**
Pseudo R^2	-.001	-.004	-.004	-.004	-.004	-.005	-.005	-.019

*, ** significant at 1%, 5% level respectively.

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using OLS estimation with correlation as dependent variables for firms who have more than 30 weeks of trading.

Table (10): OLS estimation for firms who have more than 30 weeks with correlation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.099*	-.344*	-.322*	-.323*	-.326*	-.316*	-.318*	-.221
Direct ownership percentage	.929*	.840*	.818*	.656*	.636*	.464**		
Size		.013*	.011*	.011*	.011*	.011*	.011*	.012
Financial indicator			.045*	.045*	.043*	.043*	.043*	-.112
Cross holding				.191	.185	.177	.254	.184
Same industry					.032*	.031*	.031*	.054
Same equity network						.048*	.051*	
Direct ownership indicator							.015	
Direct ownership >0								.506**
Pseudo R^2	.001	.006	.008	.009	.010	.011	.010	.051

*, ** significant at 1%, 5% level respectively.

This table presents the coefficients of direct ownership , size , financial indicator ,cross holding, same industry , same equity network, direct ownership indicator and direct ownership only for pairs who have ownership percentages using OLS estimation with frequency as dependent variables for firms who have more than 30 weeks of trading.

Table (11): OLS estimation for firms who have more than 30 weeks with frequency as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
constant	.534*	.431*	.432*	.432*	.432*	.435*	.434*	.557*
Direct ownership percentage	.266*	.245*	.243*	.217*	.216*	.171*		
Size		.003*	.003*	.003*	.003*	.003*	.003*	.000
Financial indicator			.003	.003	.003	.003	.003	-.010
Cross holding				.032	.032	.029	.054**	.027
Same industry					.002	.002	.002	.005
Same equity network						.013*	.013*	
Direct ownership indicator							.009	
Direct ownership >0								.182**
Pseudo R^2	.001	.005	.005	.005	.005	.006	.006	.032

*, ** significant at 1%, 5% level respectively.

أثر الشبكات المالية على تزامن حركة الأسعار في سوق عمان المالي

إعداد

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ملخص

تهدف هذه الدراسة الى معرفة أثر شبكات الملكية على تزامن حركة الأسعار للشركات المدرجة في سوق عمان المالي وإذا كان لأختلاف ملكية الشركات أثر على مقدار هذا التزامن.

من أجل إختبار الفرضيات نقوم بعمل الشبكات الملكية بإستخدام سجلات حقوق المساهمين للشركات المساهمة في نهاية سنة 2008 ومن ثم حساب المتغيرات التابعة مثل معامل الإرتباط ومعدل التكرار من خلال أسعار الإغلاق الإسبوعي خلال سنة 2009،وبعد حساب المتغيرات المستقلة والتابعة نجري انحدار متعدد بإستخدام Tobitو OLS. إسلوبي

أظهرت النتائج أن عوائد الشركات التي كانت تنتمي الى نفس الشبكة المالية أكثر إحتمابة بأن تتحرك بنفس الإتجاه في أي إسبوع وبالتالي تزامن حركات الأسعار تكون أعلى بين تلك الشركات.كما أظهرت النتائج بأن الشركات التي تنتمي إلى نفس الصناعة او التي تنتمي الى القطاع المالي يكون مقدار التزامن بينها وبين الشركة الأخرى أعلى من المشاهدات الأخرى وأظهرت النتائج أيضا بأن الشركات الكبيرة في المشاهدات المزدوجة يكون فيها تزامن العوائد والأسعار أعلى مقارنة بالمشاهدات التي تحتوي شركات مزدوجة صغيرة والمشاهدات التي تحتوي شركات يكون فيها استثمار مباشر تكون فيها معدل التزامن أعلى من المشاهدات الأخرى حتى بعد التحكم بأثر الحجم والانتماء للنفس القطاع.ولكن فيما يخص الاستثمار المتبادل بين الشركتين في أي مشاهدة ، أظهرت النتائج بأن ليس لها تأثير هام على تزامن حركة الأسعار.